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U. S. DEPARTMENT OF AGRICULTURE.

REPORT

OF THE

CHIEF OF THE BUREAU OF BIOLOGICAL SURVEY

FOR

1910.

BY

H. W. HENSHAW.

[From Annual Reports of the Department of Agriculture.]

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GOVERNMENT PRINTING OFFICE.
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REPORT OF THE CHIEF OF THE BUREAU OF BIOLOGICAL SURVEY.

U. S. Department of Agriculture,
Bureau of Biological Survey,
Washington, D. C., October 4, 1910.

Sir: I have the honor to transmit herewith a report on the work of the Biological Survey for the fiscal year ended June 30, 1910, with outline of work for 1911.

Respectfully,

H. W. Henshaw,
Chief, Biological Survey.

Hon. James Wilson,
Secretary of Agriculture.

WORK OF THE BIOLOGICAL SURVEY.

The work of the Biological Survey as laid down by Congress is conducted under three general heads: (1) Investigations of the economic relations of birds and mammals to agriculture; (2) investigations concerning the geographic distribution of animals and plants with reference to the determination of the life and crop belts of the country; (3) supervision of matters relating to game preservation and protection, and importation of foreign birds and other animals.

GROUND SQUIRRELS AND SPOTTED FEVER.

During the year an important investigation was begun, in cooperation with the Bureau of Entomology and the state authorities of Montana, to discover the original source of infection of the so-called spotted fever of Bitterroot Valley, Montana, and other parts of the Rocky Mountain region. This fever, which in certain localities is usually fatal, is believed to be disseminated by ticks which are harbored on ground squirrels and perhaps other mammals indigenous to the region. A first and very important step in any attempt to eradicate the disease is to discover the particular mammal or mammals which act as carriers. Two assistants of the Survey spent several months in the Bitterroot Valley studying the distribution and habits of its mammals and trapping large numbers so as to secure for study by entomologists the ticks infesting them. Individuals showing signs of disease were turned over to experts for examination with a view to the discovery of the organism causing the fever. It is believed that by these cooperative efforts definite progress has been made in the study of the etiology of this disease.

Should the ground squirrels prove to be the chief host for the tick which disseminates the dreaded fever, it is believed their extermination within the limits of the valley can be accomplished without undue expenditure of labor and money.

CALIFORNIA GROUND SQUIRREL.

Recent investigations by the Public Health and Marine-Hospital Service in California show that the infection of ground squirrels with plague is more widespread in the State than was at first supposed, and infected squirrels have been found in ten counties: Alameda, Contra Costa, Merced, Monterey, San Benito, San Joaquin, San Luis Obispo, Santa Clara, Santa Cruz, and Stanislaus. As yet, however, very few of the several thousand ground squirrels examined from those sections show infection, the total number up to June 30, 1910, being 381. The infection, therefore, while somewhat widespread, is by no means general, and it is believed that a well-organized campaign of destruction in the counties where infected rodents have been found will go far toward eliminating the danger of the plague's becoming endemic generally among the rodents of California and spreading to other States.

When poisoning operations must be conducted on the large scale necessary in the case of an animal so numerous and widely distributed as this, cost is a prime factor of the problem. Accordingly during the year careful experiments with poisons have been conducted in several parts of California to determine the cheapest and most effective method of use. Green barley heads and whole barley have been found to be the best baits, and strychnine to be the cheapest and most certain poison, provided a good quality be employed. Unfortunately, some of the strychnine bought by farmers is poor, and hence yields a minimum of effectiveness at a maximum of cost.

The best time for poisoning operations has been found to be during the late summer and fall months before the winter rains begin, not only because the animals will more readily eat poisoned bait at this time of year, but because this is the season for preventing increase, the young appearing as early as March in the southern part of the State.

Hundreds of poisoned squirrels were examined with a view to ascertaining how many young they have. They were found to be very prolific, having from 4 to 11 at a birth, or an average of 6 or 7. This prolificness goes far to explain the quickness with which a locality where a part of the squirrel population is destroyed is repopulated.

DIKE BORERS.

During the year demonstrations of methods of poisoning gophers with strychnine and catching them by means of improved traps were made in California, Arizona, and Nevada by assistants of the Survey. At Banning, Cal., by cooperation with ranchers and fruit growers, these destructive rodents were so reduced in numbers that their depredations in many localities ceased. A report from the engineer in charge of the reclamation project at Fallon, Nev., states that whereas in 1906 over 50 expensive breaks in the canals occurred in consequence of tunneling by gophers, during the past year, as a result of the adop-

tion of methods of destroying the gophers recommended by the Survey, there has not been a single break.

In some localities, as on the Zuñi Reservation in New Mexico, kangaroo rats also burrow in canal banks and cause breaks. During the year these dike injuries were investigated and recommendations for the destruction of the mammals were made, the adoption of which, it is believed, will prevent further injuries.

PRAIRIE DOGS.

Prairie dogs are confined to the States of the Middle West, where in certain regions they do great damage to the forage grasses and other vegetation. During the year experiments have been undertaken by assistants of the Survey in Arizona, Colorado, Wyoming, Montana, and New Mexico to determine the best and cheapest method of poisoning these animals, especially in summer. In fall and winter, when green food is scarce, it is comparatively easy to destroy large numbers by poisoned grain prepared according to a formula worked out by the Survey. In summer, however, when the animals are most active and most destructive and grass and other green food abounds, it is very difficult to induce them to eat poisoned grain. On account of the varying conditions of the natural food supply, further experiments will be necessary before final recommendations can be made.

SEED-EATING MAMMALS IN RELATION TO FORESTRY.

One of the most serious problems connected with the reforestation of treeless areas within the National Forests is the protection of newly planted seeds and young trees from the attacks of birds, mice, gophers, ground squirrels, rabbits, and other rodents whose depredations collectively continue the year through. This is especially true when the only practicable means of reseeding is by broadcast sowing. In certain areas within the Black Hills National Forest the losses of seed after sowing have amounted during the past year to as much as 50 and even 75 per cent. Accordingly the cooperation of the Survey was requested by the Forest Service in an attempt to devise methods of protecting seeds and saplings from such attacks. Hence two assistants visited the Forests where replanting is being conducted on a large scale to experiment with various protective coatings for seeds and also with traps and poisons. The former proved unsuccessful, but attempts to poison the mice and ground squirrels, the chief culprits, proved very successful. The baits recommended are oatmeal mixed with strychnine and water, and wheat coated with hot tallow mixed with strychnine as a protection against moisture. By distributing the poisoned bait several days in advance of the planting, the loss of seed is reduced to a minimum.

COOPERATION WITH THE PUBLIC HEALTH AND MARINE-HOSPITAL SERVICE.

At the request of the Chief of the Public Health and Marine-Hospital Service Prof. D. E. Lantz furnished several chapters for a report by that Bureau entitled "The rat in its relation to the public health." These chapters are: "Natural history of the rat;" "Natural enemies of the rat;" and "The rat as an economic factor."

COOPERATION WITH THE BUREAU OF ANIMAL INDUSTRY.

At the request of the Bureau of Animal Industry Professor Lantz was detailed to make an inspection of some of the principal packing houses in Chicago and St. Louis, with a view to the recommendation of measures for the suppression of the rat nuisance within them. In the more modern-built establishments which are intended to be rat proof comparatively little trouble is made by the rodents, but in the case of the older plants, the buildings of which may cover several acres of ground and which were constructed without reference to the invasion of rats, the loss is large. It was ascertained that in some of the plants effective work was already being done with traps, and that a substantial reduction in the number of rodents by this means had been effected. Professor Lantz's recommendations include the rat proofing of all buildings used by the packing companies, so far as this can be done consistently with economy; the constant employment within the buildings of at least one skilled trapper; the use of improved traps and certain particularly attractive baits; the elimination of all possible breeding places of rats within buildings and in contiguous sheds and outbuildings; and the employment of poison out of doors where it can be safely used.

INJURY TO TIMBER BY WOODPECKERS.

Woodpeckers are among our most useful birds, and it is difficult to overestimate the value of their services in the preservation of forests by their destruction of boring and other injurious insects. Three species, however, known as sapsuckers, while eating many insects, more than offset the good they do by boring into the cambium or inner layer of the bark of trees for the sake of the sap which exudes from the wounds. These punctures permit the entrance of moisture, bacteria, and fungi, which cause decay and staining of the wood. When the wounds heal, various distortions of the grain are produced, including more or less open knotty checks. The stains render many woods unsightly and lower their market value, and the checks, frequently numerous and of large size, diminish its workability and strength. The wood of many species is sometimes rendered useless except for fuel. The loss to the timber industry of the United States, due to defects in wood caused by sapsuckers, has been conservatively estimated to be at least $1,250,000 annually. Much pains has been taken to ascertain the principal kinds of trees attacked by these birds and the manner and extent of the injuries inflicted in order to devise protective measures, and a report covering every phase of the subject is now being prepared.

FOOD OF WILD DUCKS.

In many sections of the United States wild fowl, once so abundant, are fast becoming scarce, and the time seems to be rapidly approaching when they will no longer be available either for sport or for food. This state of things is attracting wide attention, and among other remedial measures the possibility of rearing wild ducks and geese in preserves is being earnestly discussed. The question of food supply

has an important bearing on the problem, and for years the Survey has sought to obtain all the duck stomachs possible for the purpose of accurately determining the exact nature of the food, especially of the more highly valued species. During the past year W. L. McAtee visited Wisconsin, New England, Long Island, the South Atlantic, and the Gulf States, chiefly for the purpose of studying the habits of the waterfowl on their feeding grounds, of collecting and identifying the plants they feed on, and of obtaining stomachs for examination. As a result a large amount of information was gathered and more than 700 stomachs were obtained on the trip or were subsequently sent in by sportsmen. This number increases the total on hand to approximately 3,500, the examination of which will materially add to our knowledge of the food of ducks. About 1,200 have already been examined, and a report on the subject is now being prepared for publication.

FLYCATCHERS.

The flycatchers occupy an important economic place because their food consists almost exclusively of insects, many of which are pests to the farmer. While the members of this group are among the most beneficial of birds, it has been claimed that certain species destroy honeybees and hence should be classed as obnoxious. A large number of stomachs of flycatchers, including numerous species, have been obtained and are now being examined to determine the exact status of the group. A report on the subject will be issued.

BIRDS IN RELATION TO THE GYPSY AND BROWN-TAIL MOTHS.

As is well known, the gypsy and brown-tail moths have secured a firm foothold in the New England States and have done great damage to vegetation. Some preliminary work was undertaken in Massachusetts by an assistant of the Survey for the purpose of ascertaining the extent to which birds prey on these moths. In July and August robins appeared to be devouring more gypsy moths than any other birds. Thirty-eight species of birds are now known to feed upon the gypsy moth in some of its stages, and eight species on the brown tail. To some extent birds thus act in checking the spread of these insect pests.

BIRDS IN RELATION TO THE FRUIT INDUSTRY.

During the year the second and final part of a report on the relation of birds to the fruit industry in California was published, and similar investigations were begun in Oregon and Washington, where the raising of fruit has become an important business.

BIOLOGICAL INVESTIGATIONS.

Good progress has been made in both the field and office work of this division. Field investigations of the year included parts of Arizona, Arkansas, California, Illinois, Kentucky, Missouri, Montana, New Mexico, North Dakota, Oregon, Utah, and Wyoming.

The biological survey of Colorado is practically completed, and the final report is almost ready for publication. The work in New Mexico has been practically finished, and a map and report on its life zones, with annotated lists of the mammals and birds, are being prepared for publication.

The biological survey of Wyoming has been begun with special reference to the life zones and crop areas and to the native mammals and birds and their economic relations. The Wind River and Bighorn valleys, which are covered by reclamation projects, will be taken up first. The extent of the Upper Sonoran life zone in these valleys—the zone of corn and apples—and the crops best adapted to it have been the subjects of inquiry on the part of the Reclamation Service and of prospective settlers. At the request of the Director of the Reclamation Service a provisional report on the life zones and crop adaptations in the Shoshone project has been furnished; but in order to secure more detailed information a careful field survey has been undertaken to determine accurately the boundaries of the crop zones. Field work in the lower Mississippi Valley States has continued, and has resulted in the accumulation of a large amount of information for a report on the faunal and crop areas, with lists of the mammals and birds.

In California only a small amount of work was done, but it resulted in important corrections of the state zone map which is being prepared. A biological survey of both Arizona and Utah is in progress, but considerable yet remains to be done in these areas before final reports can be prepared.

Special effort was made during the year to obtain data for corrections in the general zone map of the United States, and a revised edition is now in progress.

Satisfactory progress has been made in digesting and putting into shape for easy reference the accumulated mass of information on mammals and birds. A great amount of data on the migration and distribution of North American birds has been indexed. This information is constantly used in reports and as a guide in formulating protective regulations for game and other useful birds. Similar work is being done on North American mammals. The mapping of the distribution of both mammals and birds is advancing rapidly, and a large number of the North American species have already been mapped. These maps are invaluable for reference in connection with the study of the useful or harmful species and in planning field work and methods of protection or control.

A report on the wood rats has been prepared for publication. These mammals are of considerable economic importance in parts of the western United States, owing to their injury to crops. The fact that one of these rats in Alameda County, Cal., has been found by the Public Health and Marine-Hospital Service to be infected with plague renders it important that information shall be available on the habits and distribution of these rodents.

Individuals and institutions from all parts of the country continue to send in many birds for identification. The examination of this material enables the Survey to secure much valuable information, and often leads to cooperation in the economic investigations of the Survey.

GAME PROTECTION.

Problems in the protection of birds and game continue to increase in number and complexity. Restrictions on export and sale, restrictions on the bag limit, introduction of different forms of hunting licenses, and creation of warden systems have multiplied rapidly; state and private preserves have become an important means of conserving and increasing game: experiments in the introduction and propagation of exotic species have made notable advance in popular favor; and through a remarkable spread of interest in the study and preservation of nongame birds numerous measures for protection and increase of these birds occupy public attention.

In direct proportion to this growth have the duties of the game protection section of the Biological Survey increased and broadened. So great are the present demands, in fact, that it is not possible to keep pace with them with the force and funds at present provided. Despite these limitations substantial advance has been made along various lines.

Numerous violations of the federal law regulating interstate commerce in birds and game have been acted on. The 51 bird reservations have been divided into 6 districts to permit more systematic handling; wardens on these reservations are required to report regularly, and several of the reservations have been utilized for studying certain problems relating to the migration or the food habits of birds. Additional data have been gathered concerning hunting licenses. Data have been secured also on several other special topics, more particularly civil-service requirements for game wardens, spring shooting of waterfowl, and legislation for the protection of nongame birds. Work has been pushed on the index of game legislation and nearly all the state laws of the past decade have been indexed.

Details of the work are given herewith under appropriate heads.

IMPORTATIONS.

As required by section 241 of the Federal Criminal Code, careful supervision of the importation of birds and animals has been maintained. Five hundred and nineteen permits have been issued, authorizing the entry of 424,408 birds and 5,644 animals. The birds entered under permit consisted of 346,985 canaries, 7,199 pheasants, 18,931 partridges, and 51,293 miscellaneous birds. In addition to these, 27,333 birds and 1,016 mammals requiring no permit were admitted to entry, making the total entries during the year 361,054 canaries, 30,603 game birds, 60,084 miscellaneous birds, and 6,660 mammals. During the year 12 permits were issued at Honolulu, authorizing the entry of 103 birds and 22 mammals. Of the canaries imported, 7,747 were the popular Norwich canaries, 18 were the long and slender Yorkshire canaries, 24 were the large and heavy Manchester coppies, and 4 were the high-shouldered Belgians. The pheasants included many species imported for game preserve and aviary, 7,785 being English ringnecks. Six cheer pheasants, a species often used in England to cross with other game pheasants, were brought in. Among those imported for ornamental purposes, the rarest were 11 Formosan pheasants and 8 Siamese firebacks. Other interesting importations were 33 of the pure English, 10 true Mongolian, and 4

Prince of Wales pheasants. European partridges to the number of 18,931 were brought over to stock American game covers. The importation of game birds included many other species, particularly waterfowl, mostly intended for ornamental purposes. Notable among these were 4 ocellated turkeys, 174 Formosan teal, 2 Brazilian teal, and 3 Madagascar ducks.

Continued interest in the Shâma thrush, of India as a substitute cage bird for the mockingbird is shown by the importation of 231 of these attractive singers. Other noteworthy nongame birds imported were 19 edelsingers and 460 Lady Gould finches (a large increase of these beautifully colored birds). Two satin bower birds and a number of interesting species collected in Cuba, Mexico, and South America were imported for the New York Zoological Park. A number of the South American species were brought to the United States for the first time.

In July, 1909, information was received that 7,000 eggs had been entered at New York as the eggs of Australian boobies. Investigation disclosed that these eggs, which proved to be tern's eggs from Jamaica, in a semidecomposed condition, were being sold as food in New York restaurants at 30 cents each. Steps were at once taken by the Department of Agriculture and the Treasury Department to prevent further traffic of the kind. Early in August, 1909, a boat from Key West, Fla., returned to that port from Dog Rocks, Bahamas, with a cargo of shellfish and about 1,080 young birds, some salted, others alive. No permit having been obtained, a request for investigation was immediately preferred to the Secretary of the Treasury, who subsequently reported that the disregard of the law was not intentional, and that care would be exercised to prevent a repetition of the offense.

An application for a permit to import two mongooses for Norumbega Park, at Auburndale, Mass., was denied. A mongoose that had been surreptitiously landed at Everett, Wash., August 21, for exhibition at Seattle, was killed.

A determined effort has been made by dealers in cage birds located in Mexico to ship cardinals (redbirds) into this country for sale. Keeping cardinals in captivity is prohibited by the laws of most of the States, and the applicant in each case has been required to secure from the state game warden or commissioner a permit allowing possession before entry has been allowed. In one instance a shipment which had been surreptitiously sent to Chicago was reshipped to Mexico; other shipments were abandoned; and in only one or two cases was the shipper granted the required permit by the state officials.

Owing to pressure of other matters, completion of the card index of importations proved impracticable. The entries were, however, recorded down to December 31, 1908, and an effort will be made to bring them to date during the coming year.

Starlings.—Twenty years ago a consignment of starlings was imported into New York and liberated in Central Park. These birds soon became established in New York City, and have slowly spread to other points. Reports have been received showing their extension to Springfield, Mass., on the north and central New Jersey on the south, with one or two records still farther south. In order to ascer-

tain the exact limits of the range of this bird in the United States, the rate at which it is spreading, and its economic status, an ornithologist was detailed during June to conduct a special investigation. Stomachs have been secured, field notes of abundance and habits made, and other features of the question have been investigated. A full report of the results will be rendered during the coming year.

NATIONAL BIRD RESERVATIONS.

No change has been made during the year in either the number or the boundaries of the national bird reservations. The total number of reservations remains 51, but one of these has been transferred to the Department of Commerce and Labor. Under the act to protect the seal fisheries of Alaska, approved April 21, 1910, the Pribilof Islands in Bering Sea were placed in one reservation in charge of the Secretary of Commerce and Labor. This group includes Walrus and Otter islands, and while the bird reservation on these islands is still maintained it is no longer under the jurisdiction of this Department.

As an aid to administration the various reservations have been divided into six districts, as follows: (1) The Gulf district, including 15 reservations in Florida, Louisiana, and Porto Rico; (2) the Lake district, including 4 reservations in Michigan and North Dakota; (3) the Mountain district, including 11 reservations in the Rocky Mountain States; (4) the Pacific district, including 14 reservations in California, Oregon, and Washington; (5) the Alaska district, including 6 reservations; and (6) the Hawaiian district, including 1 reservation.

Some of the reservations on reservoir sites of the reclamation projects are not yet ready for occupancy, as construction work is still under way. These and several of the other reservations have not yet been provided with wardens. Under the appropriation for maintenance of reservations, which became available July 1, 1909, wardens have been appointed for varying periods of time at fifteen reservations, as follows: Seven in the Gulf district, two in the Lake district, five in the Pacific district, and one in the Mountain district. Several of these wardens are maintained in cooperation with the National Association of Audubon Societies, and on some of the reservations protection has been afforded the birds through light keepers and employees of the Reclamation Service.

As a means of coordinating the work of the wardens and exercising closer supervision, inspection of some of the reservations in the first and second districts was made by members of the Office, and examinations of other reservations in the first and some in the third and fourth districts were made by special inspectors. Experiments in marking birds with bands to determine the course of migration were initiated on the Stump Lake (N. Dak.) and Klamath Lake (Oreg.) reservations, and investigations to determine the homing instinct and the power of birds to find their way back to the breeding grounds, begun by Prof. J. B. Watson in 1907 on the Tortugas (Fla.) reservation, under the direction of the Carnegie Institution, were continued in the spring of 1910. The food habits of birds on this reservation and on Pelican Island also are being investigated.

The protection of birds on reservations has resulted rather unexpectedly in extending protection to certain mammals. On the

Mosquito Inlet Reservation, in Florida, since shooting has been prohibited both manatees and porpoises have been increasing in the Halifax River, and at the Lake Malheur Reservation and on the Klamath Lake Reservation, in Oregon, certain fur-bearing animals, as well as the birds, are protected. Residents have been allowed to trap muskrats and mink on the Oregon reservations under supervision during the winter months, when the birds are absent; in this way cooperation in protecting the reservation has been gained. At Klamath Lake 10 trappers caught 300 mink, 11 otters, 11 raccoons, 9 coyotes, and 13 other animals, a total of 344; while at Malheur Lake 14 trappers secured 84 mink, 2 coyotes, and 5,419 muskrats, a total of 5,505 skins.

The birds on the reservations along the Louisiana coast and on the Quillayute Needles Reservation, Wash., suffered from unfavorable weather conditions and from depredations of trespassers in a few instances. A number of eggs of gulls and terns were reported to have been taken from the Breton Reservation in 1909, and to prevent a repetition of the offense the services of a special warden have been obtained this season at Mobile, Ala., where the eggs were reported to have been taken for sale. On June 14, 1910, about 500 eggs of black skimmers were removed from Passage Key, at the mouth of Tampa Bay, Florida.

Serious depredations by Japanese occurred on Laysan and Lisiansky islands in the Hawaiian Reservation. On receipt of reports that Japanese plume hunters were operating on these islands the cooperation of the Revenue-Cutter Service was secured, and through the courtesy of the Secretary of the Treasury the cutter *Thetis* was dispatched from Honolulu to the various islands in the reservation on January 11, 1910. On both Laysan and Lisiansky parties were found who had been systematically killing the birds for several months. Twenty-three Japanese poachers were arrested and brought to Honolulu, together with about 259,000 pairs of wings and much other plumage. A considerable quantity of plumage in course of preparation was destroyed on the islands, and it was learned that one shipment from the two islands had been previously made to Japan. The total number of birds killed, as estimated by the commander of the *Thetis*, was about 300,000. In April the *Thetis* again visited the reservation, but was unable to make a landing on either Laysan or Lisiansky. No signs of poachers were found, however, and the birds were apparently nesting undisturbed. The poachers brought to Honolulu were indicted under the law protecting birds on bird reservations, but were given a nominal sentence, in view of the fact that they were evidently brought in by parties formerly interested in the guano industry on the islands. Action was also taken under the immigration law against Max Schlemmer on the charge of importing alien laborers under contract, and these cases were still pending at the close of the year.

NATIONAL BISON RANGE.

Early in October the National Bison Range at Ravalli, Mont., which had been fenced under the direction of the Forest Service, was turned over to the Biological Survey and a warden was put in charge. On October 17 a nucleus herd of 37 pure-blood buffalo,

generously donated by the American Bison Society, was placed on the range. These buffalo, with one exception, came from the herd owned by the estate of C. E. Conrad at Kalispell, and comprised 13 bulls and 24 cows, as follows: Two bulls 7 and 5 years old, 2 bulls 4 years old, 2 bulls 3 years old, 3 bulls 2 years old, and 4 bulls 1½ years old; 4 cows 6 years old, 7 cows 4 or 5 years old, 3 cows 3 years old, 5 cows 2 years old, and 5 cows 1½ years old. The animals wintered well, and during the spring 9 calves were born, making the total number in the herd 46 at the close of the fiscal year.

Unexpected delays occurred both in the construction of the fence and in completing the purchase of the land, so that the fence was built and the buffalo were delivered before all the details of the purchase had been arranged. It was then discovered that the cost of both fence and land exceeded the estimates and, the original appropriation being insufficient, it was found impracticable to complete construction of the warden's quarters. A supplementary estimate was therefore submitted to Congress through the Secretary of the Treasury, and an item was inserted in the urgent deficiency bill appropriating $7,700 for completing the fence and making the necessary additional improvements on the range. Of this sum $2,700 was for improvements, including the building of a trail along the Jocko River to facilitate patrolling the fence, placing an additional wire on the fence to make it high enough to retain elk and other big game, constructing an irrigation ditch, and completing the warden's house. This additional appropriation became available February 25, 1910, and through the cooperation of the Forest Service the improvements mentioned were begun under the direction of the district forester at Missoula.

In June 4 white-tailed deer were received from the city of Missoula for the reservation, and as 2 deer were inclosed at the time the fence was completed there is now a herd of 6 on the range.

PROTECTION OF GAME IN ALASKA.

After one year's working of the new law and regulations, it is possible to secure a fair idea of their merits and deficiencies. The governor, guided by the action of several meetings, by a conference with the game wardens held at Juneau, and by his own observations, recommended various changes in the existing law and regulations. The grand jury at the close of the December term of court at Juneau also recommended certain changes. New regulations will be issued soon after the close of the year, and, so far as is within the power of the Department, the provisions recommended will be incorporated therein.

Under authority contained in the game law the governor appointed eleven wardens, of whom three are salaried and the others unsalaried, while five of the latter are Forest Service officers. The governor reports that there are now twenty-one properly registered guides.

Application was received for a permit to purchase deer skins and manufacture them into gloves and novelties for export, but the Attorney-General, to whom the question of authority was submitted, rendered an opinion to the effect that the law does not authorize the Secretary of Agriculture to grant the desired permission.

During the present year twenty-four permits for the export of specimens of birds and mammals were issued by the Department. Under these permits there were entered at Seattle two pairs of caribou horns, and two caribou scalps for the Alaska-Yukon-Pacific Exposition, and the skull and hide of one brown bear for the Biological Survey, while under permits issued previously there were entered two moose heads, four live Emperor geese, and eight packages of specimens of birds and mammals. Forty-eight trophies, chiefly moose and brown bears, were entered under shipping licenses from the governor, and one brown bear was entered without license or permit. Nine trophies which were held up by the customs authorities were afterwards released.

INFORMATION CONCERNING GAME.

Much time has been devoted to satisfying the many demands for information concerning game and bird protection and also in securing and systematizing data. Special attention has been given to the abundance and present rate of destruction of big game, particularly deer.

Big game.—Statistics showing the abundance of big game and the effect of protection on various species were gathered. Estimates of the total kill of deer for the season were obtained from the game commissioners of Maine, Vermont, New York, Pennsylvania, Wisconsin, Minnesota, and Louisiana, and from private observers in Michigan, West Virginia, Maryland, Virginia, Georgia, Florida, Alabama, and Mississippi. It was found that the number of deer killed east of the Mississippi was about 57,500. Although this total was practically the same as last year's, yet owing to various local reasons a few States showed important differences. Thus there were increases of 2,000 in Vermont and 3,000 in New York, while Michigan and Wisconsin showed respective decreases of 3,600 and 5,000.

Personal examination was made of conditions in Michigan, Wisconsin, and Minnesota, chiefly to ascertain the extent of the destruction of deer by wolves. The results of this investigation will form the subject of a later report. Several of the deer farms of Iowa and Missouri were visited by a representative of the Biological Survey. From one of these farms the deer had escaped and were rapidly stocking the neighboring land; in one or two instances the captive deer had greatly decreased or had entirely died out.

Progress was made in ascertaining the abundance and distribution of other species of big game. Through the aid of private observers different bands of antelope were located and approximate estimates were obtained of the size of each band. Similar information was secured as regards mountain sheep, various bands of which were located, particularly in southern California.

Through the cooperation of the Forest Service much information has been gained of the areas occupied by deer, antelope, mountain sheep, bears, etc., in the national forests of Arizona, California, and New Mexico.

Game birds.—Notes on the abundance of game birds and conditions of the season were collated from sportsmen's journals in order

to secure a general view of the game field. In addition, special investigations were conducted at various ducking centers.

Data were collected concerning the introduction of the Hungarian partridge into the United States, and the material secured formed the basis of an article in the Yearbook for 1909.

No information has been received showing the existence of the quail disease that appeared with such disastrous results a few years ago. The quail raised in 1909 on the state game farm at Sutton, Mass., were nearly a total loss through a malady which, in the opinion of those in charge of the farm, resembled the quail disease; but as no post-mortem examinations were made, it is impossible to state definitely whether this was or was not the disease in question.

Index of game legislation.—A practically complete index has been made of all the game laws of the United States passed during the last decade. Indexes have also been made of the laws of every State west of the Mississippi River and of eight States in the East, viz, Alabama, Florida, Georgia, Illinois, Michigan, Virginia, West Virginia, and Wisconsin.

Game protection in 1909.—The usual résumé of game protection was published as a separate circular (No. 73). As heretofore, special attention was given to the condition of game, a feature that should be made still fuller and more serviceable.

Directory of game officials.—The names and addresses of state game officials and organizations and Audubon societies were published in the form of a circular, as usual. This directory is serviceable to a large number who desire to communicate with officers of state or private organizations.

Pheasant raising.—The material gathered in connection with the investigation of the pheasant industry in the United States was published as Farmers' Bulletin No. 390.

Private game preserves.—The data collected concerning private game preserves in the United States formed the basis of a preliminary report issued as Circular No. 72.

Fur-bearing animals.—The preparation of a compilation of laws relating to fur-bearing animals has been nearly completed.

Hunting accidents.—As usual, details were secured of the fatal hunting accidents occurring during the year, which were uncommonly frequent, being about 50 per cent more numerous than last year.

Hunting-license statistics.—Data were obtained from game officials of the United States and Canada showing the receipts from hunting licenses during the years 1907 and 1908. The growth in popularity of this means of raising revenue for proper enforcement of the game laws has been marked, and the funds at the disposal of game officials are sometimes very large, especially in California, Illinois, New York, and Wisconsin, where they exceed $100,000 a year.

COOPERATIVE WORK.

In conformity with its regular policy the office has cooperated freely with state game officials and organizations. During the year special assistance was given in California, Illinois, Indiana, Kentucky, Louisiana, Maryland, Michigan, New York, North Dakota,

Oregon, Tennessee, West Virginia, and Wisconsin. A new law adopted by the legislature of Wisconsin having provided for comprehensive civil-service examinations for deputy wardenships, the civil service commission of the State requested and received the aid of the Biological Survey in preparing and holding oral examinations for deputy game wardens. The counties of the upper peninsula of Michigan were visited by another representative of the office to ascertain the extent of the destruction of deer by wolves and to determine the most successful methods of reducing the number of wolves. As a result of cooperative effort on the part of the state warden and the Biological Survey, duck shooting and grebe hunting in southwest Oregon around the Klamath Lake Reservation was practically abolished, a number of convictions being secured. Cooperation was had with Indiana, Tennessee, Kentucky, and Illinois. Illegal traffic in game in the Kankakee Valley, Indiana, was broken up, and unlawful shipment of game in southern Illinois to East St. Louis by way of Cairo was uncovered and suppressed.

INTERSTATE COMMERCE IN GAME.

The principal center of illegal traffic in game has hitherto been the Middle West, and though under the original Lacey Act much has been done to reduce the extent of such traffic, yet the weakness of both federal and state laws has made it impossible to deal with it effectively. Sections 3 and 4 of the Lacey Act regulating interstate commerce in game were reenacted in modified and much stronger form as sections 242, 243, and 244 of the Criminal Code of the United States passed by Congress March 4, 1909, and before the new law took effect on January 1, 1910, steps were taken to prepare for its enforcement. The strengthening of the federal law and the passage of stronger state laws have developed a new situation, as shown by personal investigations in several important cities and ducking centers in the Ohio and Mississippi valleys. Through the activity of local officials the situation is practically under control in St. Louis, Mo., Cairo, Ill., Louisville, Ky., and New Orleans, La., which have heretofore furnished extensive and numerous operations in the illegal marketing of game.

The first case which arose under the new code involved the shipment from New Orleans to Chicago of 3 barrels marked "fish," but actually containing 70 wild ducks each. Conviction was secured in the federal court at New Orleans, and the two shippers were fined $50 each. A few days before the new code went into effect a case of illegal shipment of game under a false mark occurred in Indiana. A box shipped from Demotte, Ind., on December 28, 1909, containing 63 game birds was seized in Chicago, and, as it had proved extremely difficult to secure convictions merely for false marking of packages under the original Lacey Act, the matter was placed in the hands of the Indiana commissioner of fisheries and game, who not only secured conviction of the shipper, but brought action against four and convicted three persons who had sold the birds for shipment. The total fines and costs in the case amounted to $219.60—more than the maximum fine would have been had the case been prosecuted in the federal court. Three cases of falsely marked packages of game

from Tennessee were also referred to the game, fish, and forestry warden of that State for action for the reason that procedure in game cases in the Tennessee courts is unusually expeditious. A substantial fine was secured in one of these cases; the other two are still pending. Two cases involving illegal shipment of quail from Hillsboro, Kans., and Louisville, Ky., are now pending in the federal courts.

Besides these new cases, two that were pending at the time of the last report were concluded and the defendants fined. One of these cases involved the shipment of 6,000 quail from Oklahoma City, Okla., the other the shipment of 66 ducks from New Orleans, the packages in both instances being falsely marked.

PLUMAGE.

The new criminal code and several recent state laws provide more stringent regulation than heretofore of the traffic in plumage for millinery purposes, and preparations have been made to enforce these laws in several States. On the Pacific coast the game officials of Oregon and California, after having secured stronger legislation, have taken measures to suppress the sale and possession of aigrettes and plumage of American birds in those States. The matter was brought to the attention also of the convention of state game commissioners held at New Orleans in February, 1910. The state game and fish commissioner of Missouri, after returning from the convention, made preparations to enforce the state plumage law to the full, and designated one of his deputies as "plumage expert," charged with the duty of inspecting and securing satisfactory identification of the goods displayed. The Biological Survey has actively cooperated with these officials at every stage of the proceedings and especially with the commissioner of Missouri, as the attention given the subject in that State is a distinct departure in game protective work. In New York, after an active campaign, a satisfactory law was secured by bird protectionists to replace the former statute relating to plumage. Under this law, which takes effect July 1, 1911, it will be possible for this Department and the state officials in cooperation to furnish adequate protection to herons, egrets, and other American birds that are threatened with extermination because of the great demand for their plumage for hat decoration.

At the Fifth International Ornithological Congress held in Berlin in May, 1910, the subject of protection was given much consideration and resulted in the appointment of an international committee on bird protection composed of representatives of Austria, Bavaria, Belgium, Denmark, France, Germany, Great Britain, Holland, Hungary, Italy, Norway, Russia, Sweden, and the United States. Dr. T. S. Palmer, of this Bureau, and Mr. William Dutcher, president of the National Association of Audubon Societies, were appointed to represent the United States.

OUTLINE OF WORK FOR 1911.

ECONOMIC ORNITHOLOGY AND MAMMALOGY.

Work on the food habits of birds and mammals will be continued, including the examination of stomachs, tabulation of their contents, and field observations.

Field experiments will be continued to determine the most effective and economical methods of destroying the California ground squirrel, which is so injurious to crops and which is known to be a carrier of the bubonic plague.

Field experiments will be carried on in Washington and Oregon to determine methods of reducing the numbers of the several species of ground squirrels which are so injurious to grain and farm produce.

Experiments in destroying pocket gophers in orchards and farming land with poisons and improved traps will be continued.

Field observations and laboratory experiments will be carried on to devise improved methods for controlling injuries done by field mice, pine mice, and the common mice and rats. The economic relation of the common mole to agriculture will be further studied and a report prepared for publication.

Cooperation with the Forest Service will be continued to devise methods of protecting tree seeds and saplings from the attacks of birds and mammals in attempts to reforest treeless areas within the national forests.

Cooperation with the Reclamation Service in protecting dikes and fills from burrowing mammals will be carried on as in previous years.

The collecting of data relative to deer and elk farming will be continued, and the examination of skunk, mink, and fox farms will be undertaken.

Field work in connection with the relation of woodpeckers to forest insects, and of fruit-eating birds to small cultivated fruits will be continued, as also the investigation in relation to birds and the cotton boll weevil.

The investigation into the food of wild ducks and geese will be completed during the year and a report will be prepared for publication.

Preliminary field work will be taken up concerning the food of shore birds, some of which feed extensively on the young of mosquitoes.

Work on the food of the flycatchers, an important group of birds, which destroy immense numbers of injurious insects, will be completed.

GEOGRAPHIC DISTRIBUTION.

The biological survey of Wyoming will be carried on and it is believed that most of the State can be covered during the coming year. Field work in Montana, Utah, California, and the Mississippi Valley States will be continued. A large-scale zone map of the United States will be published to accompany a report on life and crop zones. Reports on the biological survey of Colorado and New Mexico will be published. A report on the birds of Arkansas will probably be made ready for publication during the year.

The reports on Colorado and New Mexico will include maps of the life and crop zones, with a discussion of their relations and of the crops best adapted to the several zonal areas. There will also be full lists of the mammals of the State, with notes on their habits, distribution, and economic relations.

GAME PROTECTION.

Much of the work of the coming year will include the continuation of projects already well under way, but in addition to these several new features will receive attention.

For the fuller supervision of importations of foreign birds and mammals into the United States inspectors will be required to examine a larger number of shipments than heretofore, the increase comprising mainly importations of game birds for stocking covers or aviaries.

Investigation of the economic habits of the starling and the present distribution and abundance of this bird in the United States will be continued, and similar investigations will be made of one or two other species imported and liberated at the same time as the starling. The object of this work is to ascertain to what extent these birds have secured a foothold in this country and what results are likely to follow their acclimatization.

Investigation of the millinery trade in the plumage of birds will be continued and extended. Through cooperation with state authorities it is hoped to accomplish much toward the suppression of the use of plumage of American birds for hat decoration.

The knowledge gained by this year's investigation of conditions in the Middle West will form a basis for measures dealing with illegal interstate shipments of game in this region. The Department is now in a position to cooperate effectively with the game officials of those States in which the bulk of the traffic occurs.

Much attention will be given to the question of securing big game to stock federal preserves. Movements are already on foot looking to the placing of antelope in the Wichita game preserve, and it is hoped that arrangements may be made for procuring a stock of deer, elk, and other species of big game for propagation on this and other federal game preserves. Material will be gathered for a history of the movement for federal protection of migratory game birds and a study will be made of the habits of these birds. The results secured will be published in bulletin form.

Warden service will be placed on such of the reservations as are shown to have immediate need of such services. The use of these colonies of birds in the study of problems relating to bird life will be encouraged.

Growing interest is manifested in the propagation of quail, and it is intended to make special investigation of methods of quail raising for publication at a later date. In this connection attention will be given to the general subject of game farming with a view to assisting state authorities to devise a system of regulation which will eliminate all opportunity of marketing wild game under cover of laws permitting the disposing of game raised in confinement.

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